

Answer on Question 68495, Physics, Mechanics, Relativity

Question:

A body hangs from a spring balance supported from the roof of an elevator. If the elevator has an upward acceleration of 3 m/s^2 and the balance reads 50 N , what is the true weight of the body?

a) 38.3 N

b) 28.3 N

c) 39.8 N

d) 50.0 N

Solution:

Let's apply the Newton's Second Law of Motion:

$$\sum F_y = ma_y, \quad T - mg = ma,$$

here, T is the tension in the spring directed upward (or the read of the spring balance), mg is the force of gravity directed downward, a is the acceleration of an elevator.

So, we get:

$$T = m(g + a).$$

From this formula we can find the mass of the body:

$$m = \frac{T}{(g + a)}.$$

Finally, we can calculate the true weight of the body:

$$W = mg = \frac{Tg}{(g + a)} = \frac{50.0 \text{ N} \cdot 9.8 \frac{\text{m}}{\text{s}^2}}{\left(9.8 \frac{\text{m}}{\text{s}^2} + 3.0 \frac{\text{m}}{\text{s}^2}\right)} = 38.3 \text{ N}.$$

Answer: a) 38.3 N .